# Soil Gas for Vapor Intrusion Assessment - Motorola 52nd Street Site

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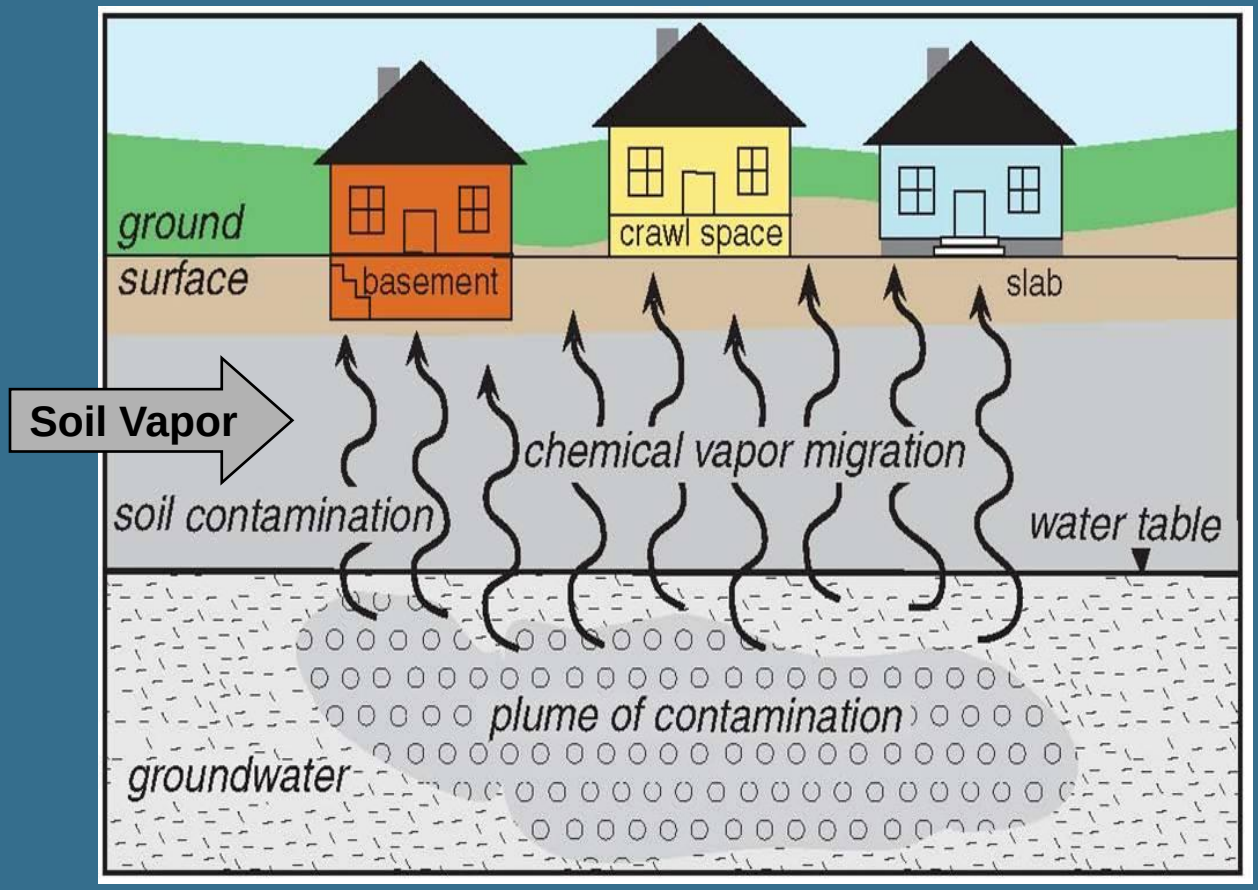
# Overview

- Evaluating Vapor Intrusion
- Soil Gas Screening Levels in Assessment of Vapor Intrusion

# Vapor Intrusion

- Volatile contaminants in soil gas can migrate up and into buildings
- Potential to create indoor air exposures
- Is there a risk?

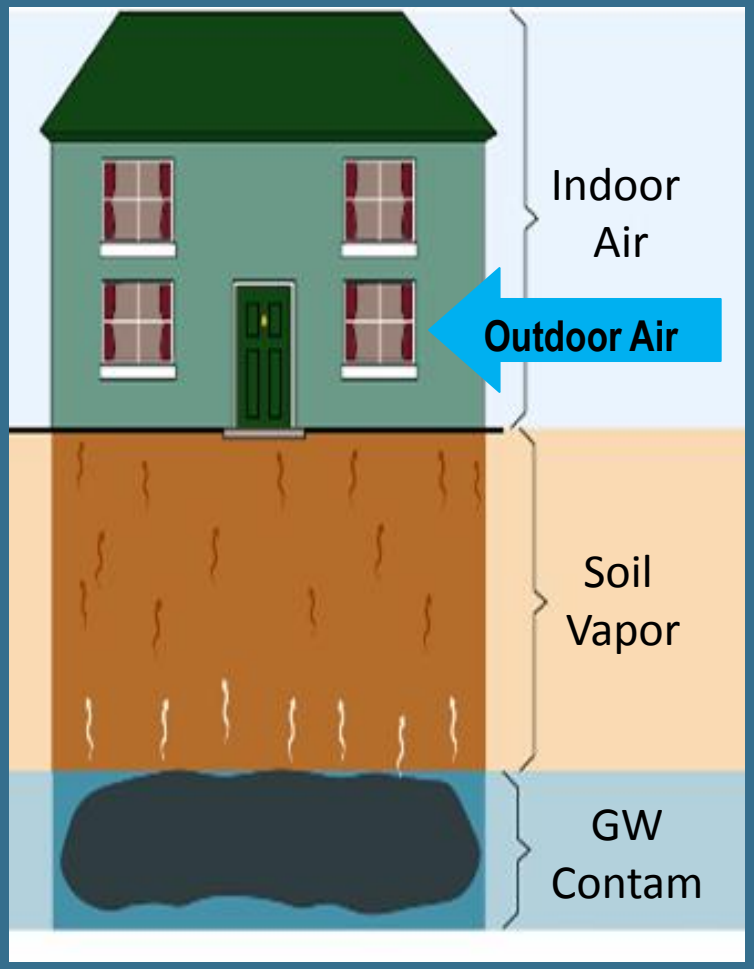


# Evaluation for Vapor Intrusion

- There are many impacts on indoor air:
  - Outdoor Air
  - Cleaning agents, toiletries & other consumer products used indoors
  - Vapor intrusion
- Evaluation of possible vapor intrusion may include:
  - Review of contaminant volatility and toxicity
  - Comparison of soil and groundwater concentrations to vapor intrusion screening levels
  - Soil gas sampling
  - Monitoring of indoor and outdoor air
  - Modeling of vapor movement from subsurface soil & groundwater into buildings

# Soil Gas and Indoor Air

- IF vapor intrusion is occurring, indoor air levels will be much lower than soil gas levels
  - most indoor air comes from outside (windows, doors, AC)
  - any soil gas that does enter a building gets diluted
- How to relate soil gas levels to indoor air levels?



# Soil Gas Screening Levels to Evaluate Vapor Intrusion

**Goal**: Evaluate if soil gas could be entering a building at concentrations of potential health concern – 3 Steps:

1. Identify protective indoor air concentration
2. Assess penetration: soil gas into indoor air
3. Calculate from protective indoor air concentration to corresponding soil gas concentration

# Step 1: Protective Indoor Air Concentrations

Indoor Air Risk-Based Screening Levels (RBSLs)

- TCE: 1.2 µg/$m^3$
- PCE: 0.4 µg/$m^3$

(micrograms per cubic meter of air)

Basis:

- 1 in one-million increased chance of developing cancer
- 24 hours/day, 350 days/year, 30 years exposure

Less frequent and/or shorter exposures = lower risk

# Step 1: Protective Indoor Air Concentrations

Candidate Indoor Air Risk-Based Screening Levels

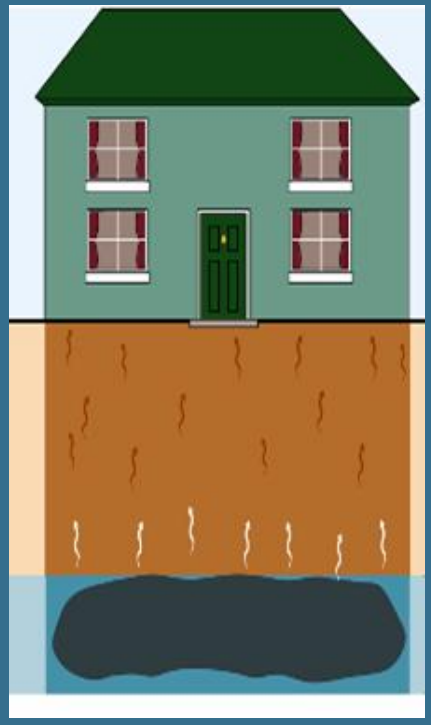
| VOC | 1 in One Million Cancer Risk | 10 in One Million Cancer Risk | 100 in One Million Cancer Risk | Non-Cancer Screening Level |
|---|---|---|---|---|
| TCE | 1.2 | 12 | 120 | 10 |
| PCE | 0.4 | 4.1 | 41 | 35 |
| | | | | Units μg/m$^3$ (micrograms per cubic meter) |

Indoor air concentration corresponding to a 1 in one-million increased chance of developing cancer is the most stringent and health protective.

# Step 2: Soil Gas Penetration Into Indoor Air

## Soil Gas Attenuation Factor

- 0.0023 ($^{1}/_{434}$) for a residential building
  - Greater than 400-fold dilution: soil gas to indoor air
  - 434 units in soil gas >> 1 unit in indoor air



Conditions:

- Sandy soil – maximum soil gas movement
- Low indoor air turnover
- Slab on grade construction

# Step 3: Soil Gas Screening Levels (SGHHSLs)

## Soil Gas Human Health Screening Levels

- Calculate soil gas concentrations corresponding to the indoor air risk-based screening levels protective for human health

| VOC | Indoor Air Risk-Based Screening Level | Attenuation Factor | Soil Gas Human Health Screening Level |
|---|---|---|---|
| TCE | 1.2 | 0.0023 | **520** |
| PCE | 0.4 | 0.0023 | **180** |

All values µg/m$^3$

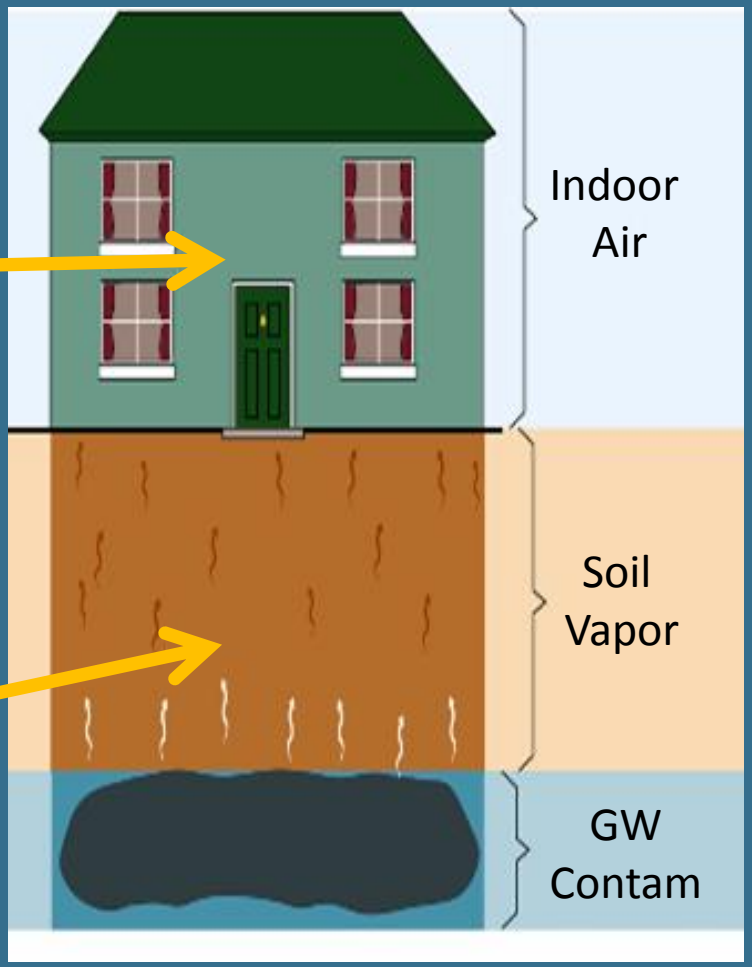
# Soil Gas Human Health Screening Levels (SGHHSLs)

THEN indoor air concentrations will be less than:

- TCE: 1.2
- PCE: 0.4

IF soil gas concentrations are less than:

- TCE: 520
- PCE: 180

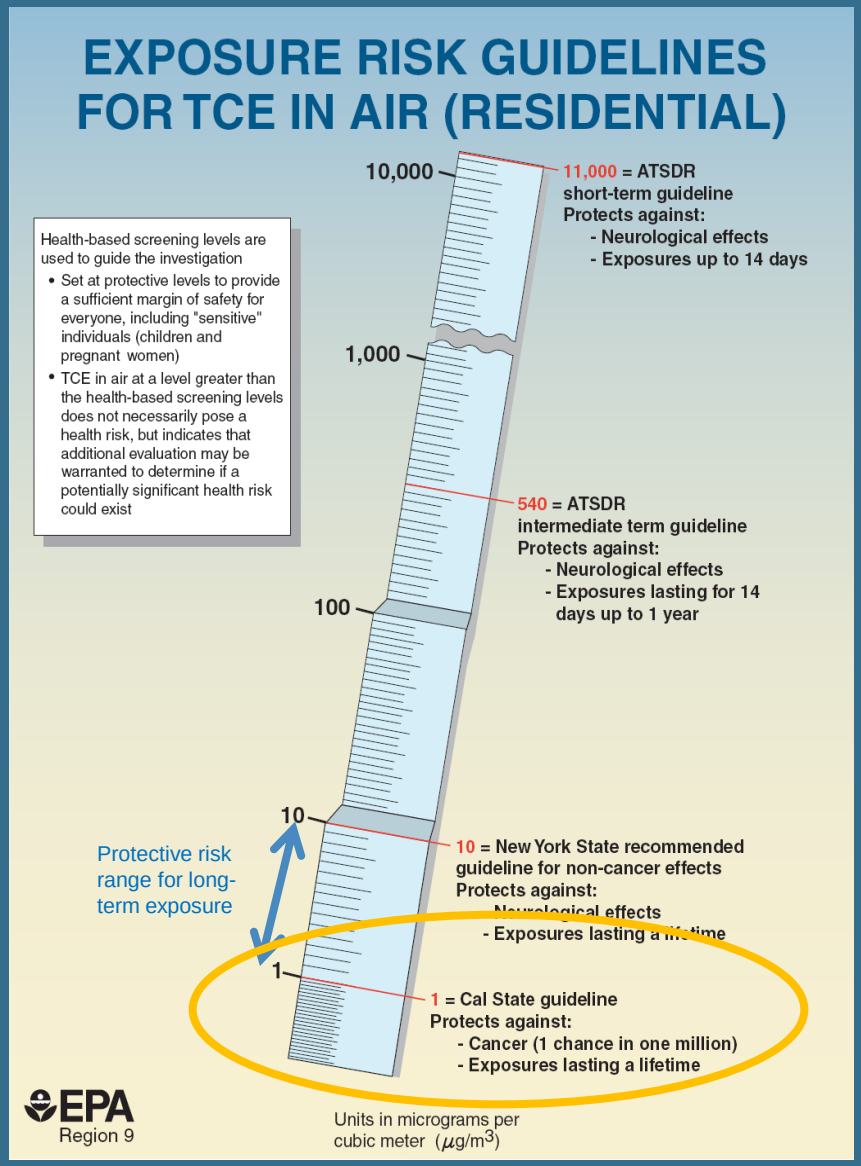


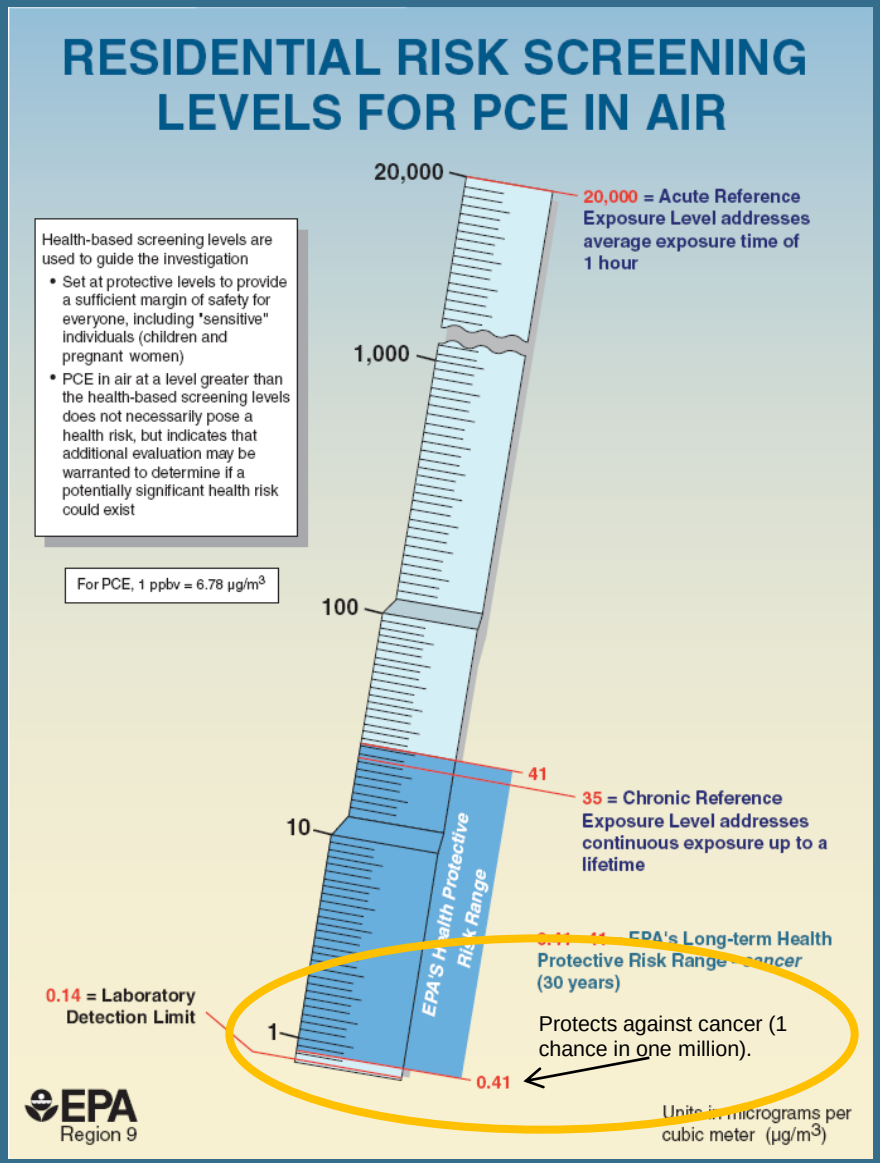

All values µg/m$^3$

# Questions?

- Group
- “Open House”

# TCE & PCE Risk-Based Screening Levels



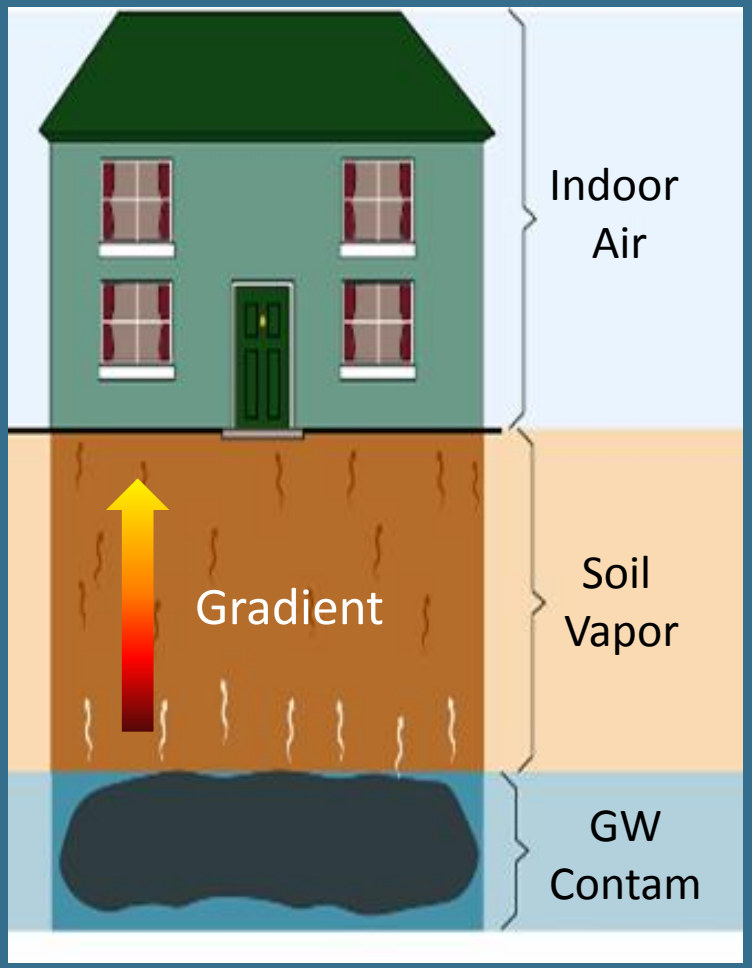



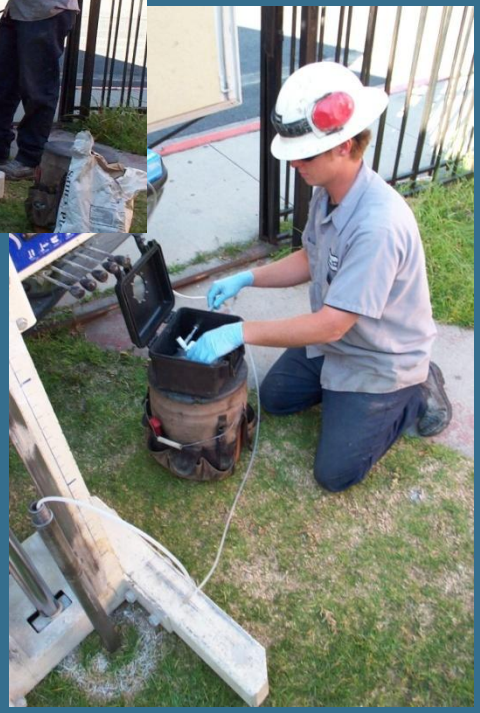
# Why Not Just Test Indoor Air?

- More intrusive
- More time-consuming
- Does not identify source
- High potential for interference from other chemicals indoors

BUT – we may still decide to sample indoors depending on soil gas results…

# Testing for Vapor Intrusion Soil Gas



# Vapor Intrusion Factors

- Contaminant levels in soil & groundwater
  - Higher levels = vapor intrusion more likely
  - Lower levels = vapor intrusion less likely
- Depth to contamination
  - Shallow = vapor intrusion more likely
  - Deeper = vapor intrusion less likely
- Soil properties can promote or retard vapor intrusion
- Features of overlying buildings:
  - Air exchange rates
  - Indoor air pressure
  - Openings to surface